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Characteristics of Emergency Departments Serving High Volumes of Safety-net Patients: United States, 2000

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

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Characteristics of Emergency Departments Serving High Volumes of Safety-net Patients: United States, 2000

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Abstract

Objective

This report describes hospital, community, and patient factors associated with emergency departments (EDs) whose case loads are driven by "safety-net" populations. The study also explores the relationship between safety-net burden and receipt of Medicaid Disproportionate Share Hospital (DSH) Program funds.

Methods

Linked data were analyzed from the 2000 National Hospital Ambulatory Medical Care Survey (NHAMCS), Area Resource File, and reports of Medicaid DSH payments to hospitals. NHAMCS ED visit data were aggregated to the hospital ED level (n=376). Hospital sampling weights were used to produce national estimates of hospital EDs. Hospitals were classified into high vs. low safety-net burden based on the percent of ED visits where the expected source of payment was Medicaid or uninsured (self-pay or no charge). High- and low-burden EDs were compared along five domains: hospital characteristics; community factors; patient mix; diagnosis mix using Billings' profiling algorithm; and condition severity, visit content, and outcome.

Results

Approximately one-third (36.1 percent) of U.S. EDs were classified as high safety-net burden providers. Hospitals located in the South were more likely to have a high ED safety-net burden (61.3%). High-burden EDs saw a higher percentage of cases that were either nonurgent or emergent, but primary care treatable. EDs high in uninsured burden were not necessarily high in Medicaid burden. Fewer than half of high-burden EDs received DSH payments.

Conclusions

High safety-net burden is not necessarily offset by public funding. The vast majority of EDs that serve high proportions of uninsured patients do not receive such compensation.

Keywords: Medicaid DSH payments • NHAMCS • health policy

Characteristics of Emergency Departments Serving High Volumes of Safety-net Patients: United States, 2000

Catharine W. Burt, Ed.D., and Irma E. Arispe, Ph.D., Division of Health Care Statistics

Introduction

An Institute of Medicine (IOM) study notes that increased numbers of uninsured Americans in a highly price-driven health care market have led to a subset of health care providers whose case load includes large proportions of low-income and uninsured patients (1). These high-burden safety-net providers include public hospital systems, community health centers, and clinics. However, the most likely source of health care for vulnerable populations is the Nation's emergency departments (EDs). The ED is open to all segments of the population, serving as a primary source of health care for many vulnerable subgroups including the uninsured, low-income underinsured, Medicaid beneficiaries, patients with special needs, individuals in geographically remote or economically disadvantaged communities, race and ethnic minorities, and immigrants.

The term "safety-net burden" is used to describe the amount of care provided to Medicaid, uninsured, and other vulnerable populations. Researchers often use the percent of Medicaid and uninsured patients as an indicator of safety-net burden (2–4). Because vulnerable populations are often clustered within communities, some hospital EDs will be more likely to have a greater caseload of such patients. For example, data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) show that hospital EDs vary widely in the proportion of visits covered by Medicaid with the 25th percentile at 9 percent and the 75th percentile at 24 percent (5).

Understanding differential safety-net burden among EDs is important for two reasons. First, because the uninsured are more likely to lack a usual source of care, delay seeking care, and not receive needed care, their visits to the ED may represent more severe or complicated cases requiring more intensive treatment, placing more demand on an already overburdened system. Second, research has shown that much of the care provided in EDs is uncompensated care (1,4,6) so that in addition to treating more complex cases, hospital EDs may not be fully compensated for the care they provide.

This study quantifies the number of hospital EDs at high risk for serving vulnerable populations and describes factors associated with high safety-net providers. The distribution of Medicaid Disproportinate Share Hospital (DSH) Program payments to high-burden safety-net providers was examined to explore the extent to which the demands of treating high safety-net cases are offset by publicly funded efforts to compensate these EDs.

Plight of Safety-net Hospitals

Hospitals with high Medicaid and/or uninsured caseloads are at higher risk than other hospitals for not being adequately compensated for the care they provide. Medicaid has generally

provided low reimbursement rates while, at the same time, Medicaid beneficiaries tend to have more diverse needs and less access to primary care and specialty physicians (1). The emergence of Medicaid managed care compounded the financial pressures of these hospitals. During the 1990s, States moved to managed care to control costs, expand coverage, and make providers more accountable for performance and quality (7). By 1998, over one-half of all Medicaid enrollees were in managed care (8). With more Medicaid beneficiaries moving toward managed care, safety-net hospital revenues are less certain. Increased Medicaid managed care risk plans negatively affect high safety-net hospitals by redistributing Medicaid patients to low safety-net hospitals (2). The effect is to further reduce revenues available to high-burden safety-net providers. At the same time, private payers have become more aggressive in controlling payment rates, which puts greater pressure on hospital revenues (9).

Hospitals serving large proportions of Medicaid inpatients are eligible to receive funds from the Medicaid DSH Program. The Medicaid DSH program was initiated in 1981 as part of the Omnibus Budget Reconciliation Act to establish payment rates that consider hospitals serving a disproportionate share of low-income patients (10). In 1997, Medicaid DSH payments from States and the Federal government totaled about $16 billion, or 10 percent of total Medicaid spending (11). In 1998, Medicaid DSH payments totaled $15 billion, or 7% of total Medicaid spending (4). Although offsetting some of the burden faced by these hospitals, DSH subsidies are not guaranteed. For example, to help curb Medicaid spending, the 1997 Balanced Budget Act (BBA) required a reduction in Medicaid DSH payments by more than $10 billion by 2002. In response to the plight of public hospitals that are dependent on DSH payments for survival, Congress passed the Benefits Improvement and Protection Act (BIPA) of 2002 and eliminated the biggest Medicaid DSH cuts planned for 2001 and 2002. BIPA also raised allotments in States with very low spending and increased allotments to public hospitals (2).

Even when DSH payments are available, not all hospitals receive the same amount relative to the safety-net care they provide. States vary widely in the Medicaid DSH payments provided to hospitals. In 1997, four States made no DSH payments, and five States made an average DSH payment of over $500 per Medicaid or uninsured person in their State. Research has shown that with the shrinking base of paying patients, high safety-net hospitals increasingly rely on subsidies to cover operating deficits (12). To survive, high-burden safety-net hospitals must increase revenues or reduce costs. This is not easy when there are an increasing number of uninsured patients and a downturn in the economy that limits revenue from State and local government subsidies.

During the 1990s in an effort to reduce costs and increase revenue, many safety-net hospitals were merged or closed (2). For those that remained open, American Hospital Association data show that many dropped services, although nonsafety-net hospitals were more likely to drop services than were safety-net hospitals. Eliminated services include Acquired Immunodeficiency Syndrome (AIDS) services, psychiatric emergency units, outpatient substance abuse services, and EDs (2). The closing of EDs has the effect of shifting patients to other EDs in the area that are still open, contributing to increases observed in both ED crowding and temporarily diverting ambulances from EDs to other hospitals in the area (13).

Identifying High Safety-net Burden EDs

Researchers have identified safety-net hospitals based on a variety of factors including ownership (not-for-profit status), status as a teaching hospital, geographic location, hospital revenue share from Medicaid, or level of uncompensated care. Zuckerman et al. (2) note that others have focused on how dependent the community is on a provider for caring for the indigent. Together these definitions suggest that safety-net provider status is composed of both hospital and community components (2). The IOM report defined the health care safety net as those providers who organize and deliver a significant level of health care to uninsured, Medicaid, and other vulnerable populations and further defined "core safety-net" providers as those with a legal mandate to have an "open door" policy regarding care regardless of ability to pay (1). For these reasons, this study focuses on EDs, defines high safety-net burden based on the compensation of caseload from Medicaid and the uninsured, and considers a range of hospital and community factors in understanding characteristics associated with safety-net burden.

Methods

A secondary analysis of data from the 2000 NHAMCS ED visit file was performed to identify hospital EDs whose caseloads include large proportions of safety-net patients. The NHAMCS is a national probability sample survey of hospital emergency and outpatient departments conducted by the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) and is aimed at describing the utilization of ambulatory care services as well as characteristics of patients seeking care and the providers who serve them.

The target universe of the NHAMCS includes visits made in the United States to EDs of non-Federal, short-stay hospitals (hospitals with an average stay of less than 30 days) or those whose specialty is general (medical or surgical) or children's general care. A four-stage probability sample design is used in NHAMCS (14). The design involves samples of primary sampling units (PSUs), hospitals within PSUs, emergency service areas within hospitals and/or clinics within outpatient departments, and patient visits within EDs and/or clinics. The first-stage sample contains 112 PSUs (geographic units consisting of counties, county equivalents, or townships), which are sampled from

PSUs in all 50 States and the District of Columbia. Within the sampled PSUs, a sample of 600 hospitals was selected and divided into 16 panels. In any 1 year, only 13 panels are used for data collection (486 hospitals). In 2000, 94 percent of the sampled hospitals with EDs participated (a total of 376 responding EDs from 398 hospitals with 24-hour EDs) (15). In hospitals with an operating ED, hospital staffs were asked to complete patient record forms for a systematic random sample of patient visits occurring during a randomly assigned 4-week reporting period. Using the ED patient arrival log, a random start was made on the first day of the reporting period with the selection of every *k*th log entry thereafter, where *k* is the inverse of the sampling fraction such that a sample of approximately 50 visits would be obtained. Encounter data included patient characteristics such as age, sex, and race, and visit characteristics such as medical diagnosis, disposition, expected source of payment, and diagnostic and therapeutic services ordered or provided. The NHAMCS has been approved by the NCHS Institutional Review Board as incurring little risk to patients' rights because the data are abstracted from existing medical records and no identifying information such as patient's name or address is collected.

Out of a total of 25,611 sample ED encounter records abstracted, there were 4,449 records where the expected source of payment was Medicaid. These cases include visits covered by the State Children's Health Insurance Program (SCHIP). There were 4,359 records with the expected pay source recorded as "self-pay" and 71 records with "no charge," and these cases are treated as uninsured within this study. Visit data were aggregated by hospital to provide estimates of facility characteristics such as the percentage of each sampled ED's visits with Medicaid and percentage of visits by uninsured patients.

Sample hospital weights were applied to provide annual national estimates. The weights include factors representing the selection of the PSU and the hospital within the PSU. Adjustment factors for hospital nonresponse and inclusion of hospital panels each year are also included (15). Because the estimates presented in this report are based on a sample rather than on the entire universe of EDs, they are subject to sampling variability. Estimates of sampling error were made using a Taylor Series approximation as computed by SUDAAN software (16), which takes the complex sampling design into account. In addition to sampling error, the NHAMCS data are also subject to nonsampling error such as omissions, mistakes in reporting, and processing error. In the 2000 NHAMCS, the quality control error rate for diagnosis coding was 1.1 percent.

Evaluating Safety-net Burden

Two approaches were used for evaluating hospital ED safety-net burden.

High vs. low burden—Hospital EDs were dichotomized into high vs. low safety-net burden. EDs were classified as high burden if their caseload met any one of the following three criteria: more than 30% of visits with Medicaid as expected source of payment, more than 30% of visits with self-pay or no charge as the expected pay source (considered uninsured), or a combined Medicaid and uninsured patient pool greater than 40% of the visits.

Of the 376 sample hospitals, 147 were classified as high burden: 53 had greater than 30% of their ED visits with Medicaid, 45 had greater than 30% of their visits by uninsured patients, and 49 had a combined Medicaid and uninsured patient pool representing greater than 40% of their caseload.

Uninsured and Medicaid case mix—Because high and low safety-net EDs were found to vary in terms of their uninsured and Medicaid burden, the second phase of analysis analyzed the following three continuous variables: percentage of ED visits that were uninsured, percentage of ED visits that were covered by Medicaid, and the total percentage of Medicaid and uninsured ED visits. Because the majority of high-burden EDs were so designated due to a combined Medicaid and uninsured burden, continuous variables were used to examine correlates of these factors. Dichotomizing the continuous variables into high- and low-burden groups masks the intensity of linear relationships among the variables.

Emergency Department Characteristics

Facility characteristics were measured in five categories: hospital characteristics; community factors; patient mix; diagnosis mix using Billings' algorithm; and condition severity, visit content, and outcome.

Hospital characteristics—Hospital size and location variables included annual ED visit volume, whether the hospital was a public hospital operated by a local or State government, whether the hospital was located in a nonmetropolitan statistical area (non-MSA), whether the hospital was located in the southern region of the United States (South), whether the hospital was affiliated with a medical school, and whether the hospital received any Medicaid DSH payment and amount received as reported from the most recent State report located on the Centers for Medicare and Medicaid Services (CMS) Web site (17). The DSH payment was merged with the NHAMCS data file based on State and hospital name.

Community factors—Community factors analyzed included geographic contextual variables, which were mostly taken from the Health Resources and Services Administration's (HRSA) Area Resource File (ARF) (18) and matched via State and county Federal Information Processing Standards (FIPS) codes to the NHAMCS hospitals. Contextual variables have been shown to be related to ED visit characteristics

(19). The ARF variables included income per capita, percent of population in poverty, unemployment rate, percent of population aged 65 years and over, the number of primary care doctors practicing per county population, ED visit rate per 100 population, and health maintenance organization (HMO) penetration rate per 100 population.

In addition to community factors from the ARF, an additional contextual variable related to the generosity of the State's Medicaid DSH payment policy was analyzed. This generosity measure was based on the ratio of the most recently reported total DSH payments to hospitals in the State to the total numbers of uninsured persons and Medicaid and SCHIP enrollees in the State. The estimates for the denominator for the ratio came from the total of uninsured individuals based on the 2000 Current Population Survey (20) and the number of Medicaid and SCHIP enrollees from the CMS (21). The DSH program payment per Medicaid/SCHIP enrollee or uninsured person in the State where the hospital was located was merged to each hospital record by State FIPS code.

Patient mix—Patient mix variables included patient demographics aggregated from the NHAMCS ED visit records, such as percentages of visits by children (under 15 years), seniors (65 years and over), and black or African Americans, and payment sources such as percentage of visits by Medicare patients. The percentage of Medicaid visits for each ED where the patient was in a risk-based plan as opposed to a fee-for-service plan was also included. Risk-based was determined by whether the visit had both Medicaid and HMO indicated on the patient record form.

Diagnosis mix—NHAMCS diagnosis data for each sampled visit, coded to the *International Classification of Diseases, 9th revision, Clinical Modification* (22), were used to classify cases according to profiling algorithms developed by John Billings et al. and based on the concept of "ambulatory care sensitive" (ACS) conditions (23–26). The original Billings algorithm, based on expert physician review of clinical information from patient records in New York City, classifies cases in terms of urgency with which the case should be seen in the ED and avoidability (the extent to which the visit could have been avoided with adequate primary care). Aggregated across all visits to the ED, the algorithm parses the caseload of visits into several different categories. The algorithm used in this study consists of the following eight categories:

- Nonemergent (NE) (e.g., toothache, back pain, ingrown toenail, eczema, and attention to dressings)
- Emergent-primary care treatable (EPCT) (e.g., nosebleed, abdominal pain/cramps, acute bronchitis, and painful breathing)
- Emergent but possibly preventable with good primary care (EDCNPA) (e.g., asthma, cellulitis, emphysema, epilepsy, and pelvic inflammatory disease)
- Emergent and not avoidable with good primary care (EDCNNPA) (e.g., heart attack, appendicitis, occlusions, kidney stone, and chest pain)
- Injury related (INJURY) (e.g., fractures, sprains, poisoning, and contusions)
- Mental health related (PSYCH) (e.g., depression, anxiety, and bipolar disorder)
- Alcohol-related diagnoses (ALCOHOL) (e.g., elevated blood alcohol, alcohol abuse, alcoholic cardiomyopathy, and blood alcohol tests)
- Unclassified (UNCLASSIFIED) diagnoses not falling into one of the other categories (e.g., abnormal blood chemistry, enlarged heart, and wheezing)

The drug-related diagnoses category in the algorithm was not used because the NHAMCS sample size is too small to reliably estimate such rare conditions.

Condition severity, visit content, and outcome—Visit characteristics included percentage of patients arriving by ambulance; percentage triaged as emergent or urgent; mean waiting time to see a physician; percentage of visits where the patient was seen by a resident or intern; percentage of cases with intravenous (IV) fluids administered; average number of drugs prescribed per visit (drug mention rate); and percentage of visits with each of the following disposition options: admitted to inpatient status, left before being seen, transfer to another facility, and no followup planned.

Data on the inpatient payer mix are not collected in the NHAMCS. Because a hospital's inpatient payer composition is critical to the determination of DSH payments, proxy variables were needed for the analysis. Although not entirely reflective of the inpatient composition, the percentages admitted from the ED that were Medicaid or uninsured were used as proxy measures for the hospital's inpatient safety-net burden.

Analysis

Analysis included SUDAAN chi-square tests of association between the safety-net status of hospital EDs and hospital facility characteristics such as geographic region, MSA status, ownership, and ED annual volume. One hospital was excluded from further analysis because the majority of visits were for mental health, drug, and alcohol conditions and appeared to be an outlier for the analysis. Student t-tests were used to evaluate the observed differences between prevalence of characteristics describing high and low safety-net hospitals. Bivariate correlations were computed for each of the variables studied with the combined percentage of ED visits that were made by Medicaid enrollees and persons with no insurance (combined burden), with percentage of ED visits by Medicaid

patients (Medicaid burden), and percentage of ED visits by uninsured patients (uninsured burden) using SUDAAN.

Results

Safety-net Burden Hospital ED Characteristics

Hospital EDs vary widely in the proportion of cases that are by uninsured and Medicaid patients with 13 percent of EDs having over half their caseload comprised of these vulnerable populations. Approximately one-third (36.1 percent) of U.S. EDs had a high safety-net burden. This corresponds to approximately 1,770 hospital EDs with high safety-net burden (95% confidence interval: 1,344–2,197). The distribution of safety-net burden is positively skewed with most hospitals having a relatively small burden, but a few hospitals having a high burden whether it is for Medicaid or for uninsured patients. The distribution of hospital EDs by their percentage of combined Medicaid and uninsured cases shows great variability across EDs (figure 1).

Figure 2 shows the distribution of hospital EDs by high and low burden. High-burden EDs are further subclassified by their composition of Medicaid and uninsured cases. EDs that were high in percentage of Medicaid cases were not necessarily high in percentage of uninsured ($\chi 2$ =.96, df=1, p=.333). In total, 9.4% of hospitals were classified as high burden because more than 30% of their ED cases were covered by Medicaid, and 7.7% had more than 30% of their cases from uninsured patients. The largest category of high safety-net hospitals had more than 40% of visits from the combination of Medicaid or uninsured cases. Two percent of hospitals in the sample had both a high Medicaid and a high uninsured burden, where each population comprised more than 30% of visits.

Table 1 shows sampled EDs and the percentage of EDs that fell into the high safety-net status by selected hospital characteristics. The majority of hospital characteristics were not associated with safety-net burden status. Geographic region was associated with burden status with 61.3 percent of EDs located in the South classified as high burden ($\chi 2$ = 20.0, df=3, p<.001). Figure 3 depicts this graphically, showing the States in each region with the corresponding probability that an ED in each region is part of the high safety-net group.

High safety-net burden designation was also associated with whether the hospital received DSH payments in 2000 ($\chi 2$ =5.2, df=1, p=.028). About half of hospitals receiving Medicaid DSH payments fell into the category of high burden (47.7%). However, of those hospitals not receiving payments, about a third had high safety-net burden EDs (29.7%).

Table 2 contrasts high and low safety-net burden hospital EDs. Consistent with the hospital domain findings presented in table 1, the majority of EDs with high burden were located in the South (65.2 compared with 23.3 percent among low-burden EDs). Less than one-half of all high safety-net EDs received some DSH payment (41.0 percent). One-quarter of low-burden EDs also received DSH payments. However, the median Medicaid DSH amount was significantly higher for high-burden hospitals (43% higher).

Several of the community factors were associated with high safety-net burden, most notably the percentage of population in poverty and the unemployment rate. As was the case with median Medicaid DSH payment, the State's ratio of total DSH payment per Medicaid/SCHIP enrollee or

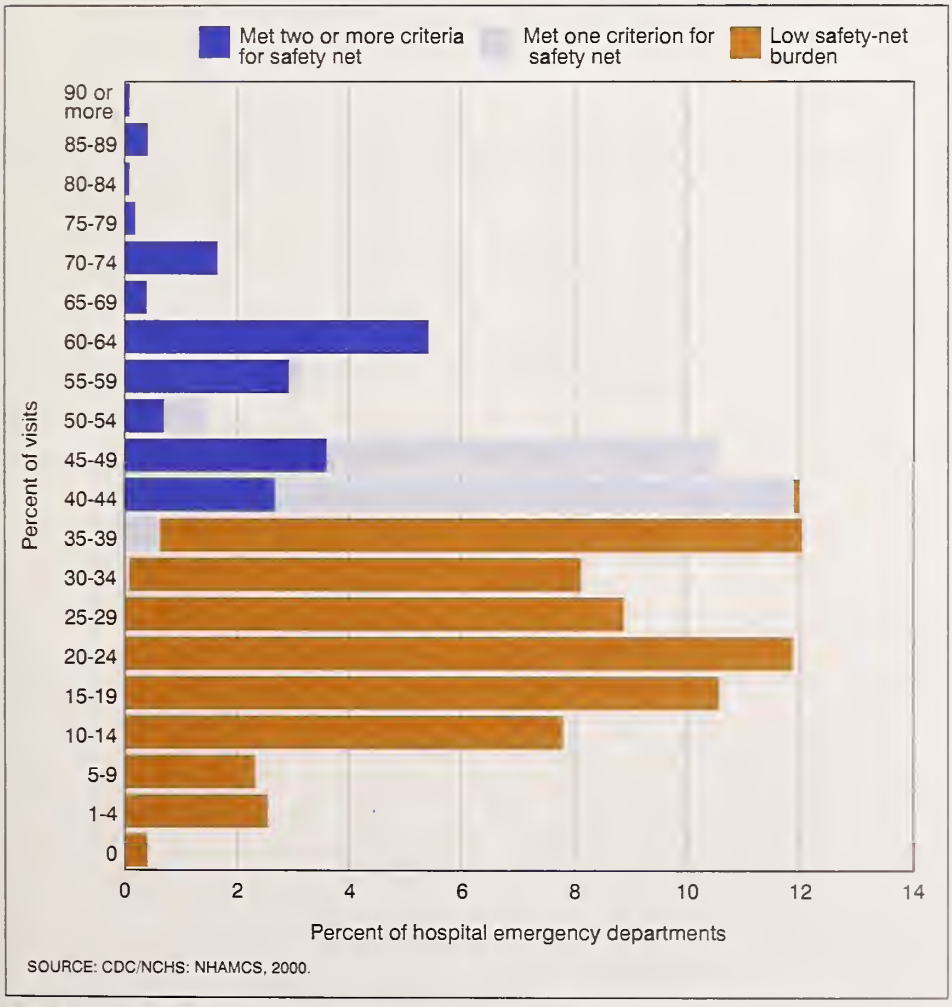
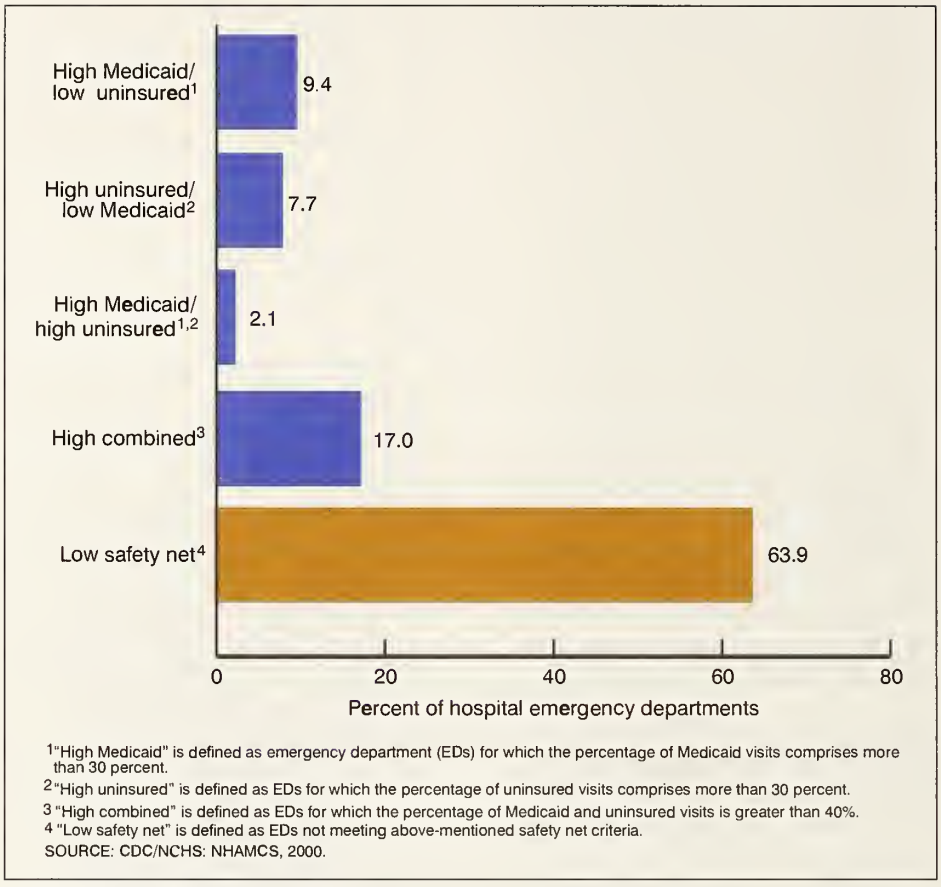


Figure 1. Distribution of hospital emergency departments by percent of visits made by Medicaid or uninsured patients grouped by safety-net criteria: United States, 2000



[1]"High Medicaid" is defined as emergency department (EDs) for which the percentage of Medicaid visits comprises more than 30 percent.
[2]"High uninsured" is defined as EDs for which the percentage of uninsured visits comprises more than 30 percent.
[3]"High combined" is defined as EDs for which the percentage of Medicaid and uninsured visits is greater than 40%.
[4]"Low safety net" is defined as EDs not meeting above-mentioned safety net criteria.
SOURCE: CDC/NCHS: NHAMCS, 2000.

Figure 2. Percent distribution of hospital emergency departments by safety-net criteria: United States, 2000

uninsured person was significantly higher in high-burden EDs compared with low-burden EDs ($204 versus $148 per uninsured or Medicaid/SCHIP individual, or about 30% higher).

High safety-net EDs have a higher proportion of visits made by children and black or African American patients, but a smaller proportion of visits by persons 65 years and over and, therefore, fewer Medicare cases. The average high safety-net ED has a combined Medicaid and uninsured patient burden of 51.0 percent compared with 23.5 percent in low safety-net EDs. There was no association between safety-net burden and the percentage of Medicaid visits from patients with risk-based Medicaid coverage.

Of the eight Billings algorithm categories used to determine the urgency and avoidability of ED visits, only a few were associated with safety-net burden status. High-burden EDs had higher percentages of nonurgent and urgent, but primary care treatable cases. Visit characteristics studied include variables related to severity, treatment, and case disposition. High-burden EDs had a higher percentage of cases seen by residents/interns, cases that left without being seen, and a higher share of cases admitted from the ED that were Medicaid. Low-burden EDs had a higher percentage of cases where IV fluids were administered and where the patient was either admitted or transferred.

Differences Among Safety-net Hospitals

Analyzing high versus low safety-net hospitals revealed that the composition of Medicaid and uninsured case mix varied by hospital for the high safety-net burden EDs. To better understand these "within group differences," the second phase of this study involved three continuous variables: percentage of ED visits covered by Medicaid, percentage of ED visits by uninsured, and percentage of ED visits by either Medicaid or uninsured. The bivariate correlation between the percentage of ED visits by Medicaid patients and the percentage by uninsured patients was not significant (r=.10) supporting the independence observed with the dichotomized safety-net variable. However, the correlation between each of these continuous variables and the percentage of visits made by either Medicaid or uninsured patients in the ED was .74 (table 3).

The bivariate correlations for the 40 ED characteristics studied and the continuous variables of Medicaid burden, uninsured burden, and combined Medicaid and uninsured burden are in table 3. Significant correlations ($p<.01$) are in bold type.

Four study variables were positively related to higher percentages for both Medicaid and uninsured: being located in the South, generosity index for the State's DSH payment, percentage of cases that were nonurgent, and percentage of ED visits by black or African American patients. Six other variables were negatively associated with both percentage of Medicaid and uninsured burden: percentage of county population that were seniors, rate of primary care physicians per population, percentage of visits made by seniors, percentage of visits by patients on Medicare, percentage of ED visits that were emergent but not avoidable, and percentage of ED cases admitted to the hospital.

Hospital EDs with higher concentrations of uninsured patients differed from those with higher concentrations of Medicaid patients in several ways. Those with a higher uninsured burden had a larger percentage of uninsured admissions, a longer mean waiting time, and a higher percentage of cases that left without being seen. They also had a lower percentage of emergent cases that were avoidable with good primary care. In contrast, those with higher Medicaid concentrations were more likely to be in impoverished communities with higher unemployment rates, lower income, and a higher ED utilization rate. Higher Medicaid-burden EDs also had more visits by children, had more Medicaid admissions, and were more likely to receive a DSH payment. They also had

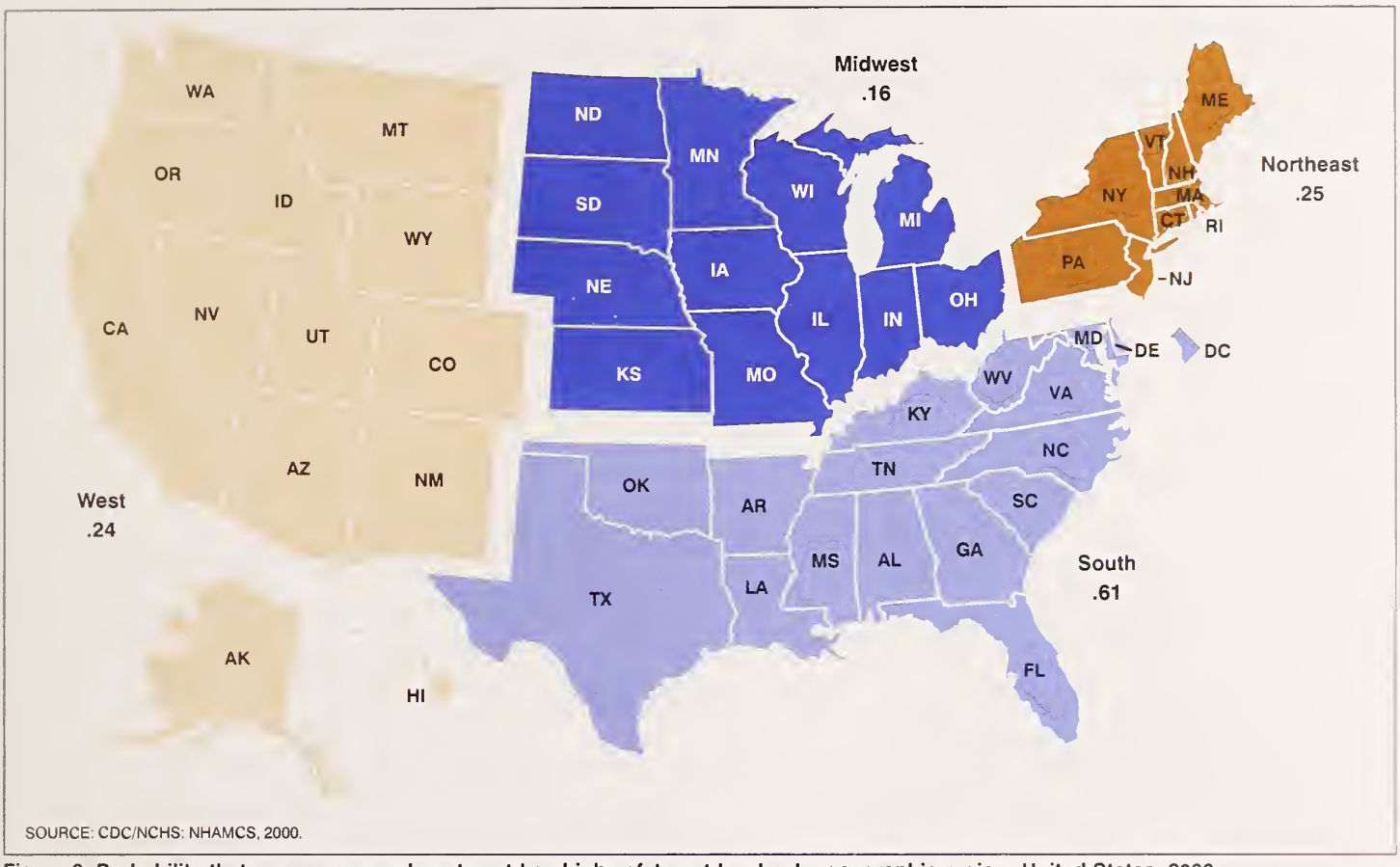


Figure 3. Probability that an emergency department has high safety-net burden by geographic region: United States, 2000

a higher percentage of emergent, primary care treatable cases and a lower percentage of injury cases.

Relationship Between Safety-net Burden and Receipt of DSH Payments

The last column in table 3 shows the bivariate correlations between each of the characteristics studied and the State's 2000 or recent Medicaid DSH payment to the hospital. The largest bivariate correlation is with annual ED volume (r=.32). Examining the other correlations in table 3 with ED volume shows that it is not related to Medicaid, uninsured, or combined burden in the ED. However, there is a slight positive relation found between amount of DSH payment received by the hospital and the percent of patients admitted from the ED that are Medicaid enrollees (r=.12). This characteristic is the only variable in this study that approaches the criteria upon which Medicaid DSH payments are based (i.e., inpatient Medicaid burden).

Discussion

Safety-net Characteristics

Approximately one-third of our Nation's EDs serve high relative proportions of uninsured and Medicaid patients. Although scattered over the 50 States and the District of Columbia, they are most likely to be located in southern States. The South accounts for about one-third of all non-Federal, general, and short-stay hospital EDs in the United States, but accounts for two-thirds of the EDs with heavy combined Medicaid and uninsured patient burden. High-burden EDs are located in areas with high poverty and unemployment and treat a higher mean percentage of visits by children and African Americans. Their diagnosis mix includes higher mean percentages of cases that are nonurgent or urgent, but primary care treatable. High-burden EDs have higher mean percentages of visits where patients leave without being seen. They also have a higher mean percentage of patients seen by residents or interns and more Medicaid cases admitted to the hospital.

In contrast, low safety-net burden EDs have a higher percentage of seniors and a higher mean percentage of visits covered by Medicare. Their case mix appears to reflect a higher severity, including higher percentages of emergent unavoidable conditions, injuries, and cases where IV fluids are administered. These EDs also have a higher mean percentage of ED cases admitted to the hospital.

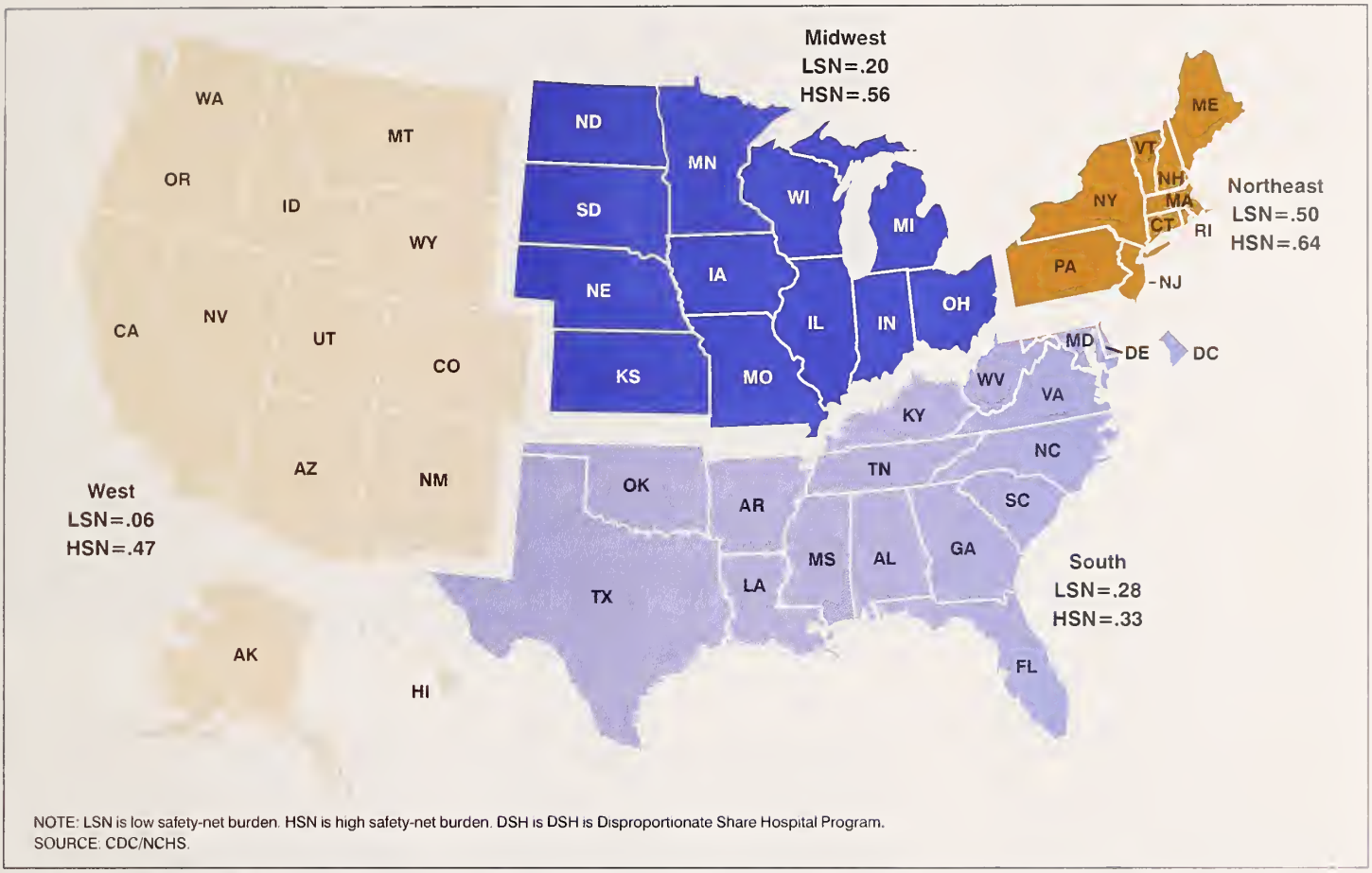
The diagnosis mix studied here using the Billings algorithm showed that high-burden EDs were more likely to have higher percentages of visits for nonurgent conditions and primary care treatable conditions, but less likely to have higher percentages of unavoidable emergent conditions and injury conditions (table 2). Other studies have shown that Medicaid and uninsured

Characteristics of high safety-net burden emergency departments:

- Comprised mostly of Medicaid or uninsured cases, but rarely high in both. Often has a moderate amount of each.
- Has a 40% chance of receiving some Medicaid DSH payments. If received, the average payment is $1.5 million.
- Located in a State with a more generous DSH payment policy.
- Three times more likely to be located in the South.
- Community is likely to have:
  - lower income per capita
  - higher percentage below poverty level
  - higher unemployment rate
  - lower percentage of seniors
  - fewer primary doctors per capita
- Emergency department patient mix has:
  - more children
  - fewer seniors
  - more black or African American patients
- Emergency department payer mix has:
  - 31% fewer Medicare patients
  - average of 26% Medicaid patients
  - average of 25% uninsured patients
- Inpatient payer mix has:
  - 22% Medicaid recipients
  - 10% uninsured patients
- Emergency department diagnosis mix has:
  - 25% more nonurgent cases presenting
  - 10% more emergent conditions presenting that are primary care treatable
  - 14% fewer unavoidable emergent conditions presenting
  - 14% fewer injury conditions presenting
- Treatment in emergency department indicates:
  - more likely to utilize residents or interns
  - less likely to need the use of intravenous fluids
- Emergency department disposition indicates:
  - 50% more likely to have patients leave without being seen
  - less likely to transfer or admit patients

patients comprise a disproportionate share of ED visits for avoidable ED care such as chronic ACS conditions (asthma, chronic obstructive lung disease, congestive heart failure, diabetes mellitus, and hypertension), which is not explained by a higher prevalence or disease severity (27) and that Medicaid patients comprise a higher proportion of ACS conditions (28). It seems reasonable that hospital EDs with high proportions of Medicaid and uninsured patients would have higher percentages of visits by patients with these kinds of conditions. However, table 2 showed that the mean percentages of emergent conditions that were avoidable with preventive care were not different between high and low safety-net hospitals.

Analysis shows that there is some variability among high safety-net burden hospitals with respect to their composition of Medicaid and uninsured



NOTE: LSN is low safety-net burden. HSN is high safety-net burden. DSH is DSH is Disproportionate Share Hospital Program.
SOURCE: CDC/NCHS.

Figure 4. Probability that a hospital received a Medicaid DSH payment by emergency department safety-net status and geographic region: United States, 2000

Characteristics not related to safety-net burden in the emergency department:

- Annual volume of visits
- Public ownership
- Whether located in a metropolitan statistical area
- Being affiliated with a medical school
- Annual emergency department utilization rate in the community
- Health maintenance organization penetration rate in the community
- Emergency department mix of Medicaid patients in a risk-based plan
- Inpatient mix of uninsured patients
- Emergency department diagnosis mix:
  - o Percentage of visits with emergent, but avoidable, conditions
  - o Percentage of mental health or alcohol-related visits
- Percentage arriving by ambulance
- Percentage triaged as urgent or emergent
- Length of waiting time to see physician
- Number of drugs prescribed
- Percentage of cases with no followup planned

cases. Most of the high safety-net hospitals were classified as high burden because the sum of the uninsured and Medicaid percentages exceeds 40% and not because the ED was high (>30%) in both Medicaid and uninsured patients. The hospitals with high numbers of Medicaid visits are also more likely to be high in visits by children (r=.42). CMS reports that children under age 18 represent about half of Medicaid enrollees. As expected, high Medicaid EDs were likely to have a higher percentage of Medicaid admissions leading, in turn, to higher DSH payments.

Almost 8% of hospitals were classified as high safety-net because their ED case mix consisted of more than 30% of uninsured cases. These hospitals had a higher percentage of admissions by the uninsured, a longer mean waiting time, and a higher

percentage of patients who left without being seen. Because of the structure of the DSH program, these hospitals are less likely to receive public compensation for safety-net burden.

Characteristics of emergency departments whose hospitals receive Medicaid DSH payments:

- More likely to be located in a State with a generous Medicaid DSH policy
- 10% more likely to be affiliated with a medical school
- Emergency department mix:
  - o 22% more children
  - o 23% fewer seniors
  - o Twice the percent of black or African American patients
- Emergency department payer mix:
  - o 20% Medicaid patients (represents a 32% higher Medicaid burden compared with hospitals that did not receive a DSH payment)
  - o 18% uninsured patients (not different from hospitals that did not receive DSH payments)
- Emergency department disposition indicates:
  - o 37% less likely to transfer cases
  - o 57% more likely to have patients leave without being seen

Role of DSH Payments in ED Safety-net Status

Analysis shows that fewer than half of high-burden EDs received any recent DSH payment, yet almost one-third of low-burden EDs also received such payments. However, the median amount received by hospitals with high-burden EDs was almost $1.5 million, an amount 42% higher than the $850,000 received by the average low-burden ED. Most at risk are those high safety-net burden hospitals which, because their EDs serve high concentrations of uninsured, are largely unable to benefit from the Medicaid DSH program. Results showed that among EDs with high uninsured burden, only 36% received a Medicaid DSH payment, whereas about half of the EDs with high Medicaid burden received a payment (47%).

Medicaid DSH payments are formulated on several factors related to hospital inpatient care such as Medicaid Inpatient Utilization Rate (MIUR), percentage of revenue from MIUR, and hospitals with low income utilization. Section 701(b) from BIPA requires States to provide DSH payment for some criteria and allows States to provide payment for other criteria. But whether the ED serves a high proportion of Medicaid and uninsured patients is not one of the criteria for either mandated or optional DSH payment.

There is great regional variability in payments received by those hospitals that benefit from DSH payments. Table 4 presents the 2000 or most recent State DSH payments reported and ratios used in this analysis in descending order of the State's generosity as indicated by the ratio of the DSH payment to the numbers of uninsured and Medicaid/SCHIP enrollees. The 2000 reports were only available for about half of the States so 1998–99 reports were used assuming that the 2000 payments were similar. The majority of States in the Northeast have DSH ratios greater than $300 compared with other regions. In contrast, approximately 20 percent of the States in the South have DSH payment ratios over $300. The majority of States in the Midwest and the West have ratios less than $100. The southern States have made strides to increase their DSH payments so that the majority of them had DSH ratios between $100 and $300 based on the most recent reports. Table 4 also shows the variation across States in the percentage of Medicaid expenditures spent on DSH payments to hospitals.

Figure 4 shows the probability of hospitals receiving any DSH payment broken down by geographic region and whether the hospital is in the high or low safety-net group. Hospitals in the West have the greatest difference in that probability based on safety-net status. The distinction in the South is the smallest in the Nation where low safety-net hospitals have a probability almost equivalent to the hospitals in the high safety-net group. However, the southern hospitals in the high safety-net group (which is the majority in the Nation), have the lowest probability of receiving any DSH payment (PR=.33). Hospitals located in the South and West are also at risk of serving a higher proportion of uninsured patients than Medicaid patients. Studies have shown that the southern and western regions of the country have twice the rate of uninsured persons to Medicaid enrollees under age 65 (4). The rate of Medicaid enrollees is fairly equivalent across all four census regions (4).

Limitations

Limitations of this study include that the variability surrounding the aggregated hospital estimates was not taken into account, only the variability among sampled hospitals. Because ED visits are sampled for a 4-week reporting period, the estimates for any given hospital may be affected by seasonality of conditions seen. Notwithstanding, a sensitivity analysis on the number of visits used in each hospital to produce the aggregated statistics was robust to sample size of the visits. Nonsampling error may be related to the expected source of payment item where some self-pay patients may have some kind of insurance, but it was incorrectly entered into the hospital computer at the time of arrival. Another limitation of the NHAMCS for studying factors associated with high safety-net use is that it does not collect any financial information from the hospital. Because the sample was drawn from the 1991

SMG, its results do not generalize to new hospitals that were not existent in 1991, but were in 2000. The DSH payments came from the CMS reports and may include some error in reporting. Similarly, the actual DSH payments for 2000 may be different for those States where the 1998 or 1999 report was used. Finally, to define uninsured, the expected source of payment categories of "self-pay" (N=4,359 visit records) and "no charge" (71 visit records) were used. Visit data were aggregated by hospital to provide estimates of facility characteristics such as the percent of each sampled ED's visits by the uninsured. Some proportion of the self-pay records are probably for patients who do have health insurance, but who pay out of pocket.

Conclusions

This study examined the distribution of hospital EDs by their likelihood of having a large caseload of patients from vulnerable populations. The fact that one-third of hospital EDs rely heavily on uninsured and/or Medicaid patients places these institutions at risk for financial viability. With evermore restrictions on Medicaid payments (29), such hospitals are less able to shift costs to cover uncompensated care that the Emergency Medical Treatment and Active Labor Act legislation demands (30). Reliance on subsidy income from the Medicaid DSH program helps less than half of high safety-net hospitals, and the amount of help varies greatly by State. High-burden EDs tend to be located in areas of poverty and relatively higher unemployment making local resources scarce for helping these hospitals stay open.

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Table 1. Number of sample and estimated hospital emergency departments, percent classified as high safety net and 95% confidence intervals by selected hospital characteristics: United States, 2000

Hospital characteristic	Emergency departments			
	Raw sample number	Estimated number	Percent with high safety-net burden[1]	95% confidence interval
All hospital emergency departments	376	4,904	36.1	27.4, 44.8
Geographic region[2]				
Northeast	85	702	24.9	13.8, 36.0
Midwest	89	1,428	15.9	7.2, 24.6
South	130	1,884	61.3	47.9, 74.7
West	72	890	24.0	5.6, 9.41
MSA status[3]				
MSA	309	2,756	38.5	30.2, 46.8
Non-MSA	67	2,148	33.1	17.2, 49.0
Ownership				
Not for profit	265	2,890	30.0	21.6, 38.4
Public	73	1,401	47.4	18.6, 76.2
Proprietary	38	613	39.3	18.5, 60.1
Emergency department volume				
Small (less than 15,000)	70	2,169	37.4	21.1, 53.7
Medium (15,000–50,000)	216	2,288	32.7	25.3, 40.1
Large (more than 50,000)	90	447	47.2	35.7, 58.7
Medical school affiliation[4]				
Yes	165	1,120	39.6	31.1, 48.0
No	202	3,619	35.4	24.6, 46.1
Any Medicaid DSH payment[4,5,6]				
Yes	132	1,398	47.7	36.6, 58.8
No	228	3,250	29.7	19.5, 39.9

[1]High safety-net burden is defined as an emergency department (ED) with more than 30% of visits by Medicaid patients, more than 30% of visits by uninsured patients, or combined Medicaid and uninsured percentages of more than 40%.

[2]Significant chi-square (p=.001).

[3]MSA is metropolitan statistical area.

[4]Medical school affiliation and Medicaid Disproportionate Share Hospital Program payment information was missing for a few hospital EDs.

[5]DSH is Disproportionate Share Hospital Program.

[6]Significant chi-square ($p < .05$).

Table 2. Comparison of characteristics of high and low safety-net burden emergency departments: United States, 2000

Emergency department characteristic	High safety-net burden[1]	Low safety-net burden	Ratio of HSN/LSN[1] burden	Significance
Raw number of sample emergency departments	146	229	...	...
Hospital factors				
Annual emergency department volume	23,950	21,440	1.12	NS
Percent:				
Public ownership	37.6	23.5	1.60	NS
Located in a non-MSA area[2]	40.2	45.9	0.87	NS
Located in the South	65.3	23.3	2.80	‡‡
Medical school affiliation	25.7	22.5	1.14	NS
Any Medicaid DSH payment received[3]	41.0	25.2	1.63	‡
Median Medicaid DSH amount[3,4]	$1,474,897	$844,842	1.75	‡
Community factors[5]				
Income per capita	$ 23,980	$ 25,970	0.92	‡
Mean percentage:				
Poverty	16.5	12.5	1.33	‡‡
Unemployed	5.2	4.1	1.27	‡‡
65 years and over	12.4	14.5	0.86	‡
Primary care physicians per population	52.5	67.0	0.78	‡
Emergency department visit rate	43.6	40.2	1.08	NS
HMO penetration rate[6]	18.2	22.2	0.82	NS
State's DSH payment ratio[3,7]	203.9	148.1	1.38	‡
Patient and payer mix				
Mean percentage visits by:				
Children	25.2	18.7	1.35	‡‡
Seniors	12.4	19.8	0.63	‡‡
Black or African Americans	26.4	10.9	2.42	‡‡
Medicare patients	13.1	19.0	0.69	‡‡
Medicaid	26.3	11.8	2.23	‡‡‡
Uninsured	24.7	11.7	2.11	‡‡‡
Combined Medicaid and uninsured	51.0	23.5	2.17	‡‡‡
Mean percentage of Medicaid visits with a risk plan	15.1	10.5	1.44	NS
Diagnosis mix				
Mean percentage visits for various conditions:				
Nonurgent	21.2	16.9	1.25	‡‡
Emergent, primary care treatable	21.3	19.3	1.10	‡‡
Emergent, but possible avoidable	7.3	8.1	0.90	NS
Emergent, but unavoidable	10.7	12.4	0.86	‡
Injury	28.1	32.8	0.86	‡‡
Mental health	1.9	2.0	0.95	NS
Alcohol related	0.6	0.7	0.86	NS
Unclassified	9.0	7.8	1.15	NS
Condition severity, visit content, and outcome				
Mean percentage visits:				
Arrival by ambulance	12.1	14.1	0.86	NS
Triaged as emergent or urgent	51.1	54.9	0.93	NS
Seen by a resident or intern	8.1	3.7	2.21	‡‡
Intravenous fluids administered	13.2	18.7	0.70	‡‡
Left before being seen	1.8	1.2	1.50	‡
Transfered to another facility	2.2	3.2	0.68	‡
No followup planned	11.3	10.0	1.14	NS
Admitted to hospital	9.2	13.9	0.66	‡‡
Medicaid admittance	22.2	6.7	3.31	‡‡
Uninsured admittance	10.2	7.1	1.44	NS
Mean waiting time (in minutes) to see physician	39.1	34.2	1.14	NS
Mean drug mention rate	1.5	1.6	0.94	NS

... Category not applicable.

‡ $p < .05$.

‡‡ $p < .01$.

‡‡‡ Variable used in the definition of safety-net burden status.

[1]High safety-net hospitals defined as those whose emergency department case load is more than 30% Medicaid, more than 30% uninsured, or more than 40% combined Medicaid and uninsured.

[2]MSA is metropolitan statistical area.

[3]DSH is Medicaid Disproportionate Share Hospital Program.

[4]Median DSH payment received by hospitals that received any DSH payment.

[5]Contextual variables are from the HRSA's Area Resource File (1999) matched by county location of hospital with the exception of State's DSH payment ratio which is calculated from the State reports to CMS.

[6]HMO is health maintenance organization.

[7]This is also referred to as State generosity index.

NOTE: HSN is high safety-net, LSN is low safety-net, and NS is not significant.

Table 3. Bivariate correlation coefficients between emergency department characteristics and continuous safety-net burden estimates and amount of Medicaid Disproportionate Share Hospital Program payment received

Emergency department characteristic	Combined Medicaid and uninsured burden	Medicaid burden	Uninsured burden	State's 2000 or recent Medicaid DSH[2] payment to hospital
Raw number of sample emergency departments	375	375	375	359
Hospital factors		Correlation coefficient		
Annual emergency department volume	0.12	0.00	0.18	**0.32**
Percent:				
Public ownership	0.10	0.04	0.10	0.08
Located in a non-MSA area[1]	-0.09	0.02	**-0.16**	-0.14
Located in the South	**0.44**	**0.23**	**0.42**	-0.04
Medical school affiliation	-0.04	-0.05	-0.01	**-0.23**
Any Medicaid DSH payment received[2]	**0.20**	**0.20**	0.10	0.30
Medicaid DSH amount[2]	**0.15**	0.12	0.10	**1.00**
Community factors[3]				
Income per capita	**-0.14**	**-0.21**	0.00	**0.15**
Percent:				
Poverty	**0.44**	**0.46**	0.20	0.03
Unemployed	**0.31**	**0.40**	0.07	0.00
65 years and over	**-0.34**	**-0.20**	**-0.30**	-0.06
Primary care physicians per population	**-0.25**	**-0.20**	**-0.16**	-0.06
Emergency department visit rate	**0.13**	**0.18**	0.02	0.07
HMO penetration rate[4]	**-0.08**	-0.11	-0.02	**0.13**
State's DSH payment ratio[2,5]	**0.27**	**0.25**	**0.15**	**0.15**
Patient and payer mix				
Percentage of visits by:				
Children	**0.29**	**0.42**	0.01	0.03
Seniors	**-0.53**	**-0.41**	**-0.38**	**-0.17**
Black or African Americans	**0.43**	**0.29**	**0.36**	**0.17**
Medicare patients	**-0.43**	**-0.31**	**-0.32**	-0.12
Medicaid	**0.74**	**1.00**	0.10	0.12
Uninsured	**0.74**	0.10	**1.00**	0.10
Combined Medicaid and uninsured	**1.00**	**0.74**	**0.74**	**0.15**
Percentage of Medicaid visits with risk plan	0.09	0.07	0.07	0.05
Diagnosis mix				
Percentage of visits for various conditions:				
Nonurgent	**0.36**	**0.22**	**0.31**	0.02
Emergent, primary care treatable	**0.18**	**0.22**	0.05	0.01
Emergent, avoidable	**-0.20**	-0.05	**-0.25**	0.01
Emergent, not avoidable	**-0.22**	**-0.17**	**-0.16**	-0.06
Injury	**-0.19**	**-0.19**	-0.09	**-0.14**
Mental health	0.03	0.08	-0.04	**0.21**
Alcohol	-0.01	-0.05	0.04	0.12
Unclassified	0.03	0.02	0.02	**0.13**
Condition severity, visit content, and outcome				
Percentage of visits:				
Arrive via ambulance	**-0.15**	**-0.18**	-0.04	0.05
Triaged as emergent or urgent	0.02	0.00	0.03	0.07
Resident/intern seen	**0.13**	**0.18**	0.01	**0.27**
Intravenous fluids administered	**-0.24**	**-0.22**	-0.13	-0.03
Left before being seen	**0.19**	0.05	0.24	0.09
Transfer to another facility	-0.12	-0.05	**-0.13**	0.04
No followup planned	0.02	0.01	-0.01	0.02
Admitted to hospital	**-0.39**	**-0.30**	**-0.28**	-0.01
Medicaid admittances	**0.38**	**0.58**	-0.01	**0.13**
Uninsured admittances	**0.18**	-0.09	**0.35**	0.04
Mean waiting time to see physician	**0.15**	0.02	0.19	**0.14**
Mean drug mention rate	-0.03	0.05	-0.11	0.07

[1]MSA is metropolitan statistical area.

[2]DSH is Disproportionate Share Hospital Program.

[3]Contextual variables placed on the State and county where the hospital is located.

[4]HMO is health maintenance organization.

[5]This is also referred to as State generosity index.

NOTES: Correlations in bold type are significantly different from zero ($p < .01$) Safety-net burden is the percent of visits made by Medicaid patients and/or uninsured patients to a given emergency department.

Table 4. Medicaid Disproportionate Share Hospital Program estimates for 2000 by State with geographic region designation, ranked by State generosity index

State	Total DSH payment[1]	State generosity index[2]	Percent of Medicaid expenditures for DSH[3]	Geographic region
New Hampshire	$ 156,569,068	$ 846	29.7	Northeast
New Jersey	983,158,288	580	22.4	Northeast
Connecticut	313,746,334	476	11.7	Northeast
Louisiana	734,339,152	454	29.0	South
South Carolina	433,786,686	402	17.6	South
Massachusetts	552,619,933	354	11.2	Northeast
Rhode Island	83,064,805	353	9.4	Northeast
Missouri	455,431,517	338	16.3	Midwest
Alabama	[4]394,719,037	337	23.3	South
Ohio	[4]636,464,508	257	10.1	Midwest
Delaware	[4]35,345,000	207	7.7	South
Texas	1,290,660,599	198	15.9	South
Colorado	[4]174,755,257	194	10.6	West
Mississippi	182,571,620	190	11.4	South
Washington	276,767,506	175	10.7	West
Nevada	[4]73,560,000	171	16.0	West
District of Columbia	[4]32,857,143	170	4.3	South
New York	1,093,003,870	169	4.3	Northeast
North Carolina	[4]338,800,136	168	7.9	South
California	1,908,263,981	163	12.4	West
Kentucky	184,266,454	156	7.1	South
Maine	48,053,303	149	4.0	Northeast
West Virginia	79,582,331	147	5.9	South
Vermont	24,500,001	140	5.8	Northeast
Illinois	433,484,493	140	6.8	Midwest
Maryland	144,651,150	131	4.8	South
Virginia	[4]163,724,595	124	7.4	South
Michigan	[4]215,041,384	107	4.6	Midwest
Indiana	[4]116,439,213	91	4.2	Midwest
Arizona	[4]122,347,000	90	6.5	West
Kansas	[4]43,549,804	86	4.0	Midwest
Florida	[4]370,754,045	80	5.8	South
Minnesota	[4]56,382,060	66	1.9	Midwest
Alaska	13,800,518	66	3.5	West
Oregon	25,165,448	30	1.6	West
Iowa	13,658,858	29	1.0	Midwest
Pennsylvania	[4]51,883,327	21	0.8	Northeast
Oklahoma	22,490,264	20	1.6	South
New Mexico	12,274,960	17	1.1	West
Wisconsin	[4]11,177,730	12	0.5	Midwest
Nebraska	[4]3,970,516	12	0.5	Midwest
Utah	4,141,404	10	0.5	West
North Dakota	1,055,485	9	0.3	Midwest
South Dakota	[4]1,075,557	7	0.3	Midwest
Idaho	1,425,518	4	0.3	Midwest
Arkansas	[4]2,172,917	3	0.2	South
Wyoming	[4]148,252	1	0.1	West
Montana	218,637	1	0.1	West
Hawaii[5]	– – –	– – –	– – –	West
Tennessee[5]	– – –	– – –	– – –	South
Georgia[5]	– – –	– – –	– – –	South

– – – Data not available.

[1]Latest reports available on the Centers for Medicare & Medicaid Services (CMS) Web site. Most are for 2000, but some are for 1998 or 1999.

[2]State generosity index is the total Medicaid DSH payment per Medicaid, State Children's Health Insurance Program, or uninsured person residing in the State. Numerator is total DSH payment, and denominator is based on Current Population Survey and Centers for Medicare & Medicaid Services (CMS) data from Statistical Census Abstracts of the United States, 2002. Also referred to as the State's DSH payment ratio.

[3]Numerator is total DSH payment, and denominator is based on total 1999 Medicaid payments from Statistical Census Abstracts of the United States, 2002.

[4]DSH reports for 2000 were unavailable so 1998 or 1999 reports were used with exception of Ohio where a 2001 report was used and Minnesota where a 1997 report was used.

[5]No DSH payment reports available between 1998 and 2001.

NOTE: DSH is Disproportionate Share Hospital Program.

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For answers to questions about the content of the data in these series, contact

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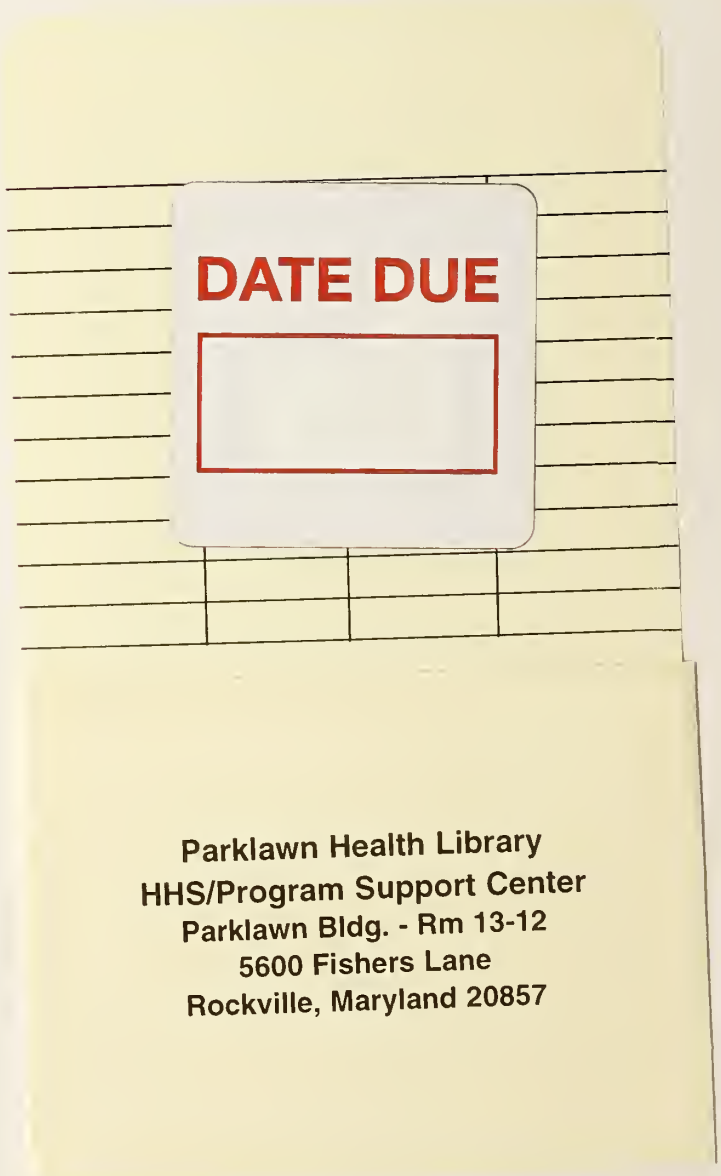

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